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Author

Title

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CHANGE TABLES

FOR

Penn Warp Machine.

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uprising every possible combination of Gears within the range of sizes as generally furnished by the manufacturers.

BY EUGENE CROSS.

GASTONIA, N. C.
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1899.

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PREFACE.

Having had occasion to frequently make use of such a table as is contained herein and being unable to find it on the market in a convenient form, I feel that this little book will meet a long felt want among superintendents, overseers and warpers.

INTRODUCTION.

No pains have been spared to make the following table absolutely correct and each change of gears was carefully worked out and the operation reversed to prove its correctness. The whole was then arranged for convenience according to the length of cuts, starting with the smallest cut expressed in yards and hundredths of a yard and opposite each cut the change gears to use to produce it.

YDS. TO CUT.	CHANGE GEARS.		
37.55	78	78	36
38.04	78	79	36
38.52	78	80	36
38.52	79	79	36
38.63	78	78	35
39.00	78	81	36
39.01	79	80	36
39.12	78	79	35
39.48	78	82	36
39.50	79	81	36
39.51	80	80	36
39.62	78	80	35
39.62	79	79	35
39.76	78	78	34
39.96	78	83	36
39.99	79	82	36
40.00	80	81	36
40.11	78	81	35
40.12	79	80	35
40.27	78	79	34

YDS. TO CUT.	CHANGE GEARS.		
40.44	78	84	36
40.47	79	83	36
40.49	80	82	36
40.50	81	81	36
40.61	78	82	35
40.63	80	80	35
40.63	79	81	35
40.78	78	80	34
40.79	79	79	34
40.93	78	85	36
40.96	79	84	36
40.97	78	78	33
40.99	80	83	36
41.00	81	82	36
41.10	78	83	35
41.13	79	82	35
41.14	80	81	35
41.29	78	81	34
41.31	79	80	34
41.41	78	86	36

YDS. TO CUT.	CHANGE GEARS.		
41.45	79	85	36
41.48	80	84	36
41.49	78	79	33
41.50	81	83	36
41.51	82	82	36
41.60	78	84	35
41.63	79	83	35
41.65	80	82	35
41.66	81	81	35
41.80	78	82	34
41.82	79	81	34
41.83	80	80	34
41.93	79	86	36
41.97	80	85	36
42.00	81	84	36
42.01	82	83	36
42.01	78	80	33
42.03	79	79	33
42.09	78	85	35
42.13	79	84	35

YDS. TO CUT.	CHANGE GEARS.		
42.16	80	83	35
42.17	81	82	35
42.25	78	78	32
42.31	78	83	34
42.34	79	82	34
42.35	80	81	34
42.47	80	86	36
42.50	81	85	36
42.52	82	84	36
42.52	83	83	36
42.53	78	81	33
42.56	79	80	33
42.59	78	86	35
42.63	79	85	35
42.66	80	84	35
42.68	81	83	35
42.69	82	82	35
42.79	78	79	32
42.82	78	84	34
42.86	79	83	34

YDS. TO CUT.	CHANGE GEARS.		
42.87	80	82	34
42.88	81	81	34
43.00	81	86	36
43.02	82	85	36
43.04	83	84	36
43.06	78	82	33
43.09	79	81	33
43.10	80	80	33
43.13	79	86	35
43.17	80	85	35
43.20	81	84	35
43.21	82	83	35
43.33	78	80	32
43.33	78	85	34
43.34	79	79	32
43.37	79	84	34
43.40	80	83	34
43.41	81	82	34
43.53	82	86	36
43.55	83	85	36

YDS. TO CUT.	CHANGE GEARS.		
43.55	84	84	36
43.59	78	83	33
43.61	78	78	31
43.62	79	82	33
43.64	80	81	33
43.68	80	86	35
43.71	81	85	35
43.73	82	84	35
43.74	83	83	35
43.84	78	86	34
43.87	78	81	32
43.89	79	85	34
43.89	79	80	32
43.92	80	84	34
43.94	81	83	34
43.95	82	82	34
44.06	83	86	36
44.07	84	85	36
44.11	78	84	33
44.15	79	83	33

YDS. TO CUT.	CHANGE GEARS.		
44.17	78	79	31
44.17	80	82	33
44.18	81	81	33
44.23	81	86	35
44.25	82	85	35
44.27	83	84	35
44.40	79	86	34
44.42	78	82	32
44.44	79	81	32
44.44	80	80	32
44.44	80	85	34
44.47	81	84	34
44.48	82	83	34
44.59	84	86	36
44.60	85	85	36
44.64	78	85	33
44.69	79	84	33
44.71	80	83	33
44.73	81	82	33
44.73	78	80	31

YDS. TO CUT.	CHANGE GEARS.		
44.74	79	79	31
44.77	82	86	35
44.79	83	85	35
44.80	84	84	35
44.96	78	83	32
44.97	80	86	34
44.99	79	82	32
45.00	81	85	34
45.00	80	81	32
45.02	82	84	34
45.02	83	83	34
45.07	78	78	30
45.12	85	86	36
45.17	78	86	33
45.22	79	85	33
45.25	80	84	33
45.27	81	83	33
45.28	82	82	33
45.29	78	81	31
45.30	79	80	31

YDS. TO CUT.	CHANGE GEARS.		
45.32	83	86	35
45.33	84	85	35
45.50	78	84	32
45.53	79	83	32
45.53	81	86	34
45.55	82	85	34
45.55	80	82	32
45.56	81	81	32
45.57	83	84	34
45.64	78	79	30
45.65	86	86	36
45.75	79	86	33
45.79	80	85	33
45.82	81	84	33
45.83	82	83	33
45.85	78	82	31
45.87	79	81	31
45.87	84	86	35
45.87	85	85	35
45.88	80	80	31

YDS. TO CUT.	CHANGE GEARS.		
46.04	78	85	32
46.08	79	84	32
46.09	82	86	34
46.11	83	85	34
46.11	80	83	32
46.12	84	84	34
46.12	81	82	32
46.22	78	80	30
46.23	79	79	30
46.33	80	86	33
46.36	81	85	33
46.38	82	84	33
46.39	83	83	33
46.41	85	86	35
46.41	78	83	31
46.44	79	82	31
46.45	80	81	31
46.58	78	86	32
46.62	78	78	29
46.63	79	85	32

YDS. TO CUT.	CHANGE GEARS		
46.65	83	86	34
46.67	84	85	34
46.67	80	84	32
46.69	81	83	32
46.69	82	82	32
46.80	78	81	30
46.81	79	80	30
46.91	81	86	33
46.94	82	85	33
46.95	83	84	33
46.96	86	86	35
46.97	78	84	31
47.00	79	83	31
47.02	80	82	31
47.03	81	81	31
47.18	79	86	32
47.21	84	86	34
47.22	85	85	34
47.22	80	85	32
47.22	78	79	29

YDS. TO CUT.	CHANGE GEARS.		
47.25	81	84	32
47.26	82	83	32
47.38	78	82	30
47.40	79	81	30
47.41	80	80	30
47.49	82	86	33
47.51	83	85	33
47.51	84	84	33
47.53	78	85	31
47.57	79	84	31
47.60	80	83	31
47.61	81	82	31
47.78	85	86	34
47.78	80	86	32
47.81	81	85	32
47.82	78	80	29
47.82	79	79	29
47.83	82	84	32
47.84	83	83	32
47.95	78	83	30

YDS. TO CUT.	CHANGE GEARS.		
47.98	79	82	30
48.00	80	81	30
48.07	83	86	33
48.08	84	85	33
48.09	78	86	31
48.14	79	85	31
48.17	80	84	31
48.19	81	83	31
48.20	82	82	31
48.28	78	78	28
48.34	86	86	34
48.37	81	86	32
48.40	82	85	32
48.41	78	81	29
48.42	83	84	32
48.43	79	80	29
48.53	78	84	30
48.57	79	83	30
48.59	80	82	30
48.60	81	81	30

YDS. TO CUT.	CHANGE GEARS.		
48.65	84	86	33
48.65	85	85	33
48.70	79	86	31
48.74	80	85	31
48.77	81	84	31
48.79	82	83	31
48.90	78	79	28
48.97	82	86	32
48.99	83	85	32
49.00	84	84	32
49.01	78	82	29
49.03	79	81	29
49.04	80	80	29
49.11	78	85	30
49.15	79	84	30
49.18	80	83	30
49.20	81	82	30
49.22	85	86	33
49.32	80	86	31
49.35	81	85	31

YDS. TO CUT.	CHANGE GEARS.		
49.38	83	83	31
49.38	82	84	31
49.52	78	80	28
49.53	79	79	28
49.57	83	86	32
49.58	84	85	32
49.61	78	83	29
49.64	79	82	29
49.65	80	81	29
49.69	78	86	30
49.74	79	85	30
49.78	80	84	30
49.80	81	83	30
49.80	86	86	33
49.81	82	82	30
49.93	81	86	31
49.96	82	85	31
49.98	83	84	31
50.07	78	78	27
50.14	78	81	28

YDS. TO CUT.	CHANGE GEARS.		
50.16	79	80	28
50.17	84	86	32
50.17	85	85	32
50.21	78	84	29
50.24	79	83	29
50.27	80	82	29
50.27	81	81	29
50.32	79	86	30
50.37	80	85	30
50.40	81	84	30
50.41	82	83	30
50.55	82	86	31
50.57	83	85	31
50.58	84	84	31
50.72	78	79	27
50.76	85	86	32
50.76	78	82	28
50.78	79	81	28
50.79	80	80	28
50.80	78	85	29

YDS. TO CUT.	CHANGE GEARS.		
50.85	79	84	29
50.88	80	83	29
50.90	81	82	29
50.96	80	86	30
51.00	81	85	30
51.02	82	84	30
51.03	83	83	30
51.17	83	86	31
51.18	84	85	31
51.36	86	86	32
51.36	78	80	27
51.37	79	79	27
51.38	78	83	28
51.40	78	86	29
51.41	79	82	28
51.43	80	81	28
51.45	79	85	29
51.49	80	84	29
51.52	81	83	29
51.52	82	82	29

YDS. TO CUT.	CHANGE GEARS.		
51.60	81	86	30
51.63	82	85	30
51.64	83	84	30
51.78	84	86	31
51.79	85	85	31
52.00	78	84	28
52.00	78	81	27
52.00	78	78	26
52.02	79	80	27
52.04	79	83	28
52.06	80	82	28
52.06	79	86	29
52.07	81	81	28
52.11	80	85	29
52.14	81	84	29
52.15	82	83	29
52.24	82	86	30
52.26	83	85	30
52.27	84	84	30
52.40	85	86	31

YDS. TO CUT.	CHANGE GEARS.		
52.62	78	85	28
52.64	78	82	27
52.67	79	84	28
52.67	79	81	27
52.67	80	80	27
52.67	78	79	26
52.70	80	83	28
52.71	81	82	28
52.72	80	86	29
52.76	81	85	29
52.78	82	84	29
52.79	83	83	29
52.87	83	86	30
52.89	84	85	30
53.02	86	86	31
53.24	78	86	28
53.28	78	83	27
53.29	79	85	28
53.32	79	82	27
53.33	80	84	28

YDS. TO CUT.	CHANGE GEARS.		
53.33	80	81	27
53.33	78	80	26
53.34	79	79	26
53.36	81	83	28
53.36	82	82	28
53.38	81	86	29
53 41	82	85	29
53.42	83	84	29
53.51	84	86	30
53.52	85	85	30
53.92	79	86	28
53.93	78	84	27
53.97	80	85	28
53.97	79	83	27
53.99	80	82	27
54.00	81	84	28
54.00	81	81	27
54.00	78	81	26
54.01	82	83	28
54.02	79	80	26

YDS. TO CUT.	CHANGE GEARS.		
54.04	82	86	29
54.06	83	85	29
54.07	84	84	29
54.08	78	78	25
54.15	85	86	30
54.57	78	85	27
54.60	80	86	28
54.62	79	84	27
54.64	81	85	28
54.65	80	83	27
54.67	82	84	28
54.67	83	83	28
54.67	81	82	27
54.67	78	82	26
54.69	79	81	26
54.70	83	86	29
54.70	80	80	26
54.71	84	85	29
54.77	78	79	25
54.78	86	86	30

YDS. TO CUT.	CHANGE GEARS.		
55.21	78	86	27
55.27	79	85	27
55.28	81	86	28
55.31	80	84	27
55.32	82	85	28
55.33	83	84	28
55.33	81	83	27
55.33	78	83	26
55.34	82	82	27
55.36	84	86	29
55.36	85	85	29
55.37	79	82	26
55.38	80	81	26
55.47	78	80	25
55.47	79	79	25
55.92	79	86	27
55.97	82	86	28
55.97	80	85	27
55.99	83	85	28
56.00	84	84	28

YDS. TO CUT.	CHANGE GEARS.		
56.00	81	84	27
56.00	78	84	26
56.01	85	86	29
56.02	82	83	27
56.04	79	83	26
56.07	80	82	26
56.08	81	81	26
56.16	78	81	25
56.18	79	80	25
56.33	78	78	24
56.62	80	86	27
56.65	83	86	28
56.67	86	86	29
56.67	84	85	28
56.67	81	85	27
56.67	78	85	26
56.69	82	84	27
56.70	83	83	27
56.72	79	84	26
56.75	80	83	26

YDS. TO CUT.	CHANGE GEARS.		
56.77	81	82	26
56.85	78	82	25
56.88	79	81	25
56.88	80	80	25
57.06	78	79	24
57.33	84	86	28
57.33	81	86	27
57.33	78	86	26
57.34	85	85	28
57.37	82	85	27
57.38	83	84	27
57.39	79	85	26
57.43	80	84	26
57.46	81	83	26
57.47	82	82	26
57.55	78	83	25
57.58	79	82	25
57.59	80	81	25
57.78	78	80	24
57.79	79	79	24

YDS. TO CUT.	CHANGE GEARS.		
58.01	85	86	28
58.04	82	86	27
58.06	83	85	27
58.07	84	84	27
58.07	79	86	26
58.12	80	85	26
58.15	81	84	26
58.17	82	83	26
58.24	78	84	25
58.28	79	83	25
58.31	80	82	25
58.32	81	81	25
58.50	78	81	24
58.52	79	80	24
58.70	86	86	28
58.75	83	86	27
58.76	84	85	27
58.78	78	78	23
58.80	80	86	26
58.85	81	85	26

YDS. TO CUT.	CHANGE GEARS.		
58.87	82	84	26
58.88	83	83	26
58.93	78	85	25
58.99	79	84	25
59.02	80	83	25
59.04	81	82	25
59.22	78	82	24
59 25	79	81	24
59.26	80	80	24
59.46	84	86	27
59.46	85	85	27
59.54	81	86	26
59.54	78	79	23
59.57	82	85	26
59.59	83	84	26
59.63	78	86	25
59.69	79	85	25
59.73	80	84	25
59.76	81	83	25
59.77	82	82	25

YDS. TO CUT.	CHANGE GEARS.		
59.94	78	83	24
59.98	79	82	24
60.00	80	81	24
60.16	85	86	27
60.27	82	86	26
60.29	78	80	23
60.30	83	85	26
60.30	79	79	23
60.31	84	84	26
60.39	79	86	25
60.44	80	85	25
60.48	81	84	25
60.50	82	83	25
60.67	78	84	24
60.71	79	83	24
60.74	80	82	24
60.75	81	81	24
60.87	86	86	27
61.01	83	86	26
61.02	84	85	26

YDS. TO CUT.	CHANGE GEARS.		
61.04	78	81	23
61.06	79	80	23
61.15	80	86	25
61.20	81	85	25
61.23	82	84	25
61.23	83	83	25
61.39	78	85	24
61.44	79	84	24
61.45	78	78	22
61.48	80	83	24
61.50	81	82	24
61.74	84	86	26
61.75	85	85	26
61.80	78	82	23
61.83	79	81	23
61.83	80	80	23
61.92	81	86	25
61.95	82	85	25
61.97	83	84	25
62.11	78	86	24

YDS. TO CUT.	CHANGE GEARS.		
62.17	79	85	24
62.22	80	84	24
62.24	78	79	22
62.25	81	83	24
62.26	82	82	24
62.48	85	86	26
62.55	78	83	23
62.59	79	82	23
62.61	80	81	23
62.68	82	86	25
62.71	83	85	25
62.72	84	84	25
62.91	79	86	24
62.96	80	85	24
63.00	81	84	24
63.02	82	83	24
63.03	78	80	22
63.04	79	79	22
63.21	86	86	26
63.30	78	84	23

YDS. TO CUT.	CHANGE GEARS.		
63.35	79	83	23
63.38	80	82	23
63.39	81	81	23
63.45	83	86	25
63.47	84	85	25
63.70	80	86	24
63.75	81	85	24
63.78	82	84	24
63.79	83	83	24
63.82	78	81	22
63.84	79	80	22
64.06	78	85	23
64.11	79	84	23
64.15	80	83	23
64.17	81	82	23
64.21	84	86	25
64.22	85	85	25
64.38	78	78	21
64.50	81	86	24
64.54	82	85	24

YDS. TO CUT.	CHANGE GEARS.		
64.55	83	84	24
64.61	78	82	22
64.64	79	81	22
64.65	80	80	22
64.81	78	86	23
64.88	79	85	23
64.93	80	84	23
64.96	81	83	23
64.97	82	82	23
64.98	85	86	25
65.21	78	79	21
65.30	82	86	24
65.32	83	85	24
65.33	84	84	24
65.39	78	83	22
65.43	79	82	22
65.45	80	81	22
65.64	79	86	23
65.70	80	85	23
65.74	81	84	23

YDS. TO CUT.	CHANGE GEARS.		
65.74	86	86	25
65.76	82	83	23
66.03	78	80	21
66.04	79	79	21
66.09	83	86	24
66.11	84	85	24
66.18	78	84	22
66.23	79	83	22
66.26	80	82	22
66.27	81	81	22
66.47	80	86	23
66.52	81	85	23
66.55	82	84	23
66.56	83	83	23
66.86	78	81	21
66.88	79	80	21
66.89	84	86	24
66.90	85	85	24
66.97	78	85	22
67.03	79	84	22

YDS. TO CUT.	CHANGE GEARS.		
67.07	80	83	22
67.09	81	82	22
67.30	81	86	23
67.34	82	85	23
67.36	83	84	23
67.60	78	78	20
67.68	78	82	21
67.68	85	86	24
67.71	79	81	21
67.72	80	80	21
67.76	78	86	22
67.83	79	85	22
67.88	80	84	22
67.91	81	83	22
67.92	82	82	22
68.13	82	86	23
68.16	83	85	23
68.17	84	84	23
68.47	78	79	20
68.48	86	86	24

YDS. TO CUT.	CHANGE GEARS.		
68.51	78	83	21
68.55	79	82	21
68.57	80	81	21
68.63	79	86	22
68.69	80	85	22
68.73	81	84	22
68.75	82	83	22
68.97	83	86	23
68.98	84	85	23
69.33	78	84	21
69.33	78	80	20
69.34	79	79	20
69.39	79	83	21
69.42	80	82	21
69.43	81	81	21
69.49	80	86	22
69.54	81	85	22
69.57	82	84	22
69.58	83	83	22
69.80	84	86	23

YDS. TO CUT.	CHANGE GEARS.		
69.81	85	85	23
70.16	78	85	21
70.20	78	81	20
70.22	79	80	20
70.22	79	84	21
70.26	80	83	21
70.28	81	82	21
70.36	81	86	22
70.40	82	85	22
70.42	83	84	22
70.63	85	86	23
70.98	78	86	21
71.06	79	85	21
71.07	78	82	20
71.10	79	81	20
71.11	80	84	21
71.11	80	80	20
71.14	81	83	21
71.15	82	82	21
71.16	78	78	19

YDS. TO CUT.	CHANGE GEARS.		
71.23	82	86	22
71.26	83	85	22
71.27	84	84	22
71.46	86	86	23
71.89	79	86	21
71.93	78	83	20
71.96	80	85	21
71.98	79	82	20
72.00	81	84	21
72.00	80	81	20
72.02	82	83	21
72.07	78	79	19
72.10	83	86	22
72.12	84	85	22
72.80	80	86	21
72.80	78	84	20
72.85	79	83	20
72.86	81	85	21
72.89	82	84	21
72.89	80	82	20

YDS. TO CUT.	CHANGE GEARS.		
72.90	83	83	21
72.90	81	81	20
72.97	84	86	22
72.98	85	85	22
72.98	78	80	19
72.99	79	79	19
73.67	78	85	20
73.71	81	86	21
73.73	79	84	20
73.76	82	85	21
73.78	83	84	21
73.78	80	83	20
73.80	81	82	20
73.84	85	86	22
73.89	78	81	19
73.92	79	80	19
74.53	78	86	20
74.61	79	85	20
74.62	82	86	21
74.66	83	85	21

YDS. TO CUT.	CHANGE GEARS.		
74.67	84	84	21
74.67	80	84	20
74.70	81	83	20
74.71	82	82	20
74.71	86	86	22
74.81	78	82	19
74.84	79	81	19
74.85	80	80	19
75.11	78	78	18
75.49	79	86	20
75.53	83	86	21
75.55	84	85	21
75.55	80	85	20
75.60	81	84	20
75.62	82	83	20
75.72	78	83	19
75.77	79	82	19
75.79	80	81	19
76.07	78	79	18
76.44	84	86	21

YDS. TO CUT.	CHANGE GEARS.		
76.44	80	86	20
76.45	85	85	21
76.50	81	85	20
76.53	82	84	20
76.54	83	83	20
76.63	78	84	19
76.69	79	83	19
76.72	80	82	19
76.74	81	81	19
77.04	78	80	18
77.05	79	79	18
77.35	85	86	21
77.40	81	86	20
77.44	82	85	20
77.47	83	84	20
77.54	78	85	19
77.61	79	84	19
77.66	80	83	19
77.68	81	82	19
78.00	78	81	18

YDS. TO CUT.	CHANGE GEARS.		
78.02	79	80	18
78.26	86	86	21
78.35	82	86	20
78.39	83	85	20
78.40	84	84	20
78.46	78	86	19
78.54	79	85	19
78.60	80	84	19
78.63	81	83	19
78.64	82	82	19
78.96	78	82	18
79.00	79	81	18
79.01	80	80	18
79.31	83	86	20
79.33	84	85	20
79.46	79	86	19
79.53	80	85	19
79.53	78	78	17
79.58	81	84	19
79.60	82	83	19

YDS. TO CUT.	CHANGE GEARS.		
79.92	78	83	18
79.97	79	82	18
80.00	80	81	18
80.27	84	86	20
80.28	85	85	20
80.47	80	86	19
80.53	81	85	19
80.55	78	79	17
80.56	82	84	19
80.57	83	83	19
80.89	78	84	18
80.95	79	83	18
80.99	80	82	18
81.00	81	81	18
81.22	85	86	20
81.47	81	86	19
81.52	82	85	19
81.54	83	84	19
81.57	78	80	17
81.58	79	79	17

YDS. TO CUT.	CHANGE GEARS.		
81.85	78	85	18
81.92	79	84	18
81.97	80	83	18
82.00	81	82	18
82.18	86	86	20
82.48	82	86	19
82.51	83	85	19
82.53	84	84	19
82.59	78	81	17
82.61	79	80	17
82.81	78	86	18
82.90	79	85	18
82.96	80	84	18
83.00	81	83	18
83.01	82	82	18
83.48	83	86	19
83.51	84	85	19
83.61	78	82	17
83.65	79	81	17
83.66	80	80	17

YDS. TO CUT.	CHANGE GEARS.		
83.88	79	86	18
83.95	80	85	18
84.00	81	84	18
84.02	82	83	18
84.49	84	86	19
84.50	85	85	19
84.50	78	78	16
84.63	78	83	17
84.68	79	82	17
84.70	80	81	17
84.94	80	86	18
85.00	81	85	18
85.04	82	84	18
85.05	83	83	18
85.50	85	86	19
85.58	78	79	16
85.65	78	84	17
85.71	79	83	17
85.75	80	82	17
85.76	81	81	17

YDS. TO CUT.	CHANGE GEARS.		
86.00	81	86	18
86.05	82	85	18
86.07	83	84	18
86.50	86	86	19
86.67	78	85	17
86.67	78	80	16
86.68	79	79	16
86.74	79	84	17
86.80	80	83	17
86.82	81	82	17
87.06	82	86	18
87.10	83	85	18
87.11	84	84	18
87.69	78	86	17
87.75	78	81	16
87.78	79	80	16
87.78	79	85	17
87.84	80	84	17
87.88	81	83	17
87.89	82	82	17

YDS. TO CUT.	CHANGE GEARS.		
88.12	83	86	18
88.15	84	85	18
88.81	79	86	17
88.83	78	82	16
88.87	79	81	16
88.89	80	80	16
88.89	80	85	17
88.94	81	84	17
88.97	82	83	17
89.18	84	86	18
89.20	85	85	18
89.92	78	83	16
89.93	80	86	17
89.97	79	82	16
90.00	81	85	17
90.00	80	81	16
90.04	82	84	17
90.05	83	83	17
90.13	78	78	15
90.25	85	86	18

YDS. TO CUT.	CHANGE GEARS.		
91.00	78	84	16
91.06	81	86	17
91.07	79	83	16
91.11	80	82	16
91.11	82	85	17
91.12	81	81	16
91.14	83	84	17
91.29	78	79	15
91.31	86	86	18
92.08	78	85	16
92.17	79	84	16
92.18	82	86	17
92.22	83	85	17
92.22	80	83	16
92.23	84	84	17
92.25	81	82	16
92.44	78	80	15
92.46	79	79	15
93.17	78	86	16
93.26	79	85	16

YDS. TO CUT.	CHANGE GEARS.		
93.31	83	86	17
93.33	84	85	17
93.33	80	84	16
93.37	81	83	16
93.39	82	82	16
93.60	78	81	15
93.63	79	80	15
94.36	79	86	16
94.43	84	86	17
94.44	85	85	17
94.44	80	85	16
94.50	81	84	16
94.53	82	83	16
94.75	78	82	15
94.80	79	81	15
94.81	80	80	15
95.55	85	86	17
95.55	80	86	16
95.62	81	85	16
95.67	82	84	16

YDS. TO CUT.	CHANGE GEARS.		
95.68	83	83	16
95.91	78	83	15
95.97	79	82	15
96.00	80	81	15
96.57	78	78	14
96.68	86	86	17
96.75	81	86	16
96.80	82	85	16
96.83	83	84	16
97.07	78	84	15
97.14	79	83	15
97.18	80	82	15
97.20	81	81	15
97.81	78	79	14
97.94	82	86	16
97.99	83	85	16
98.00	84	84	16
98.22	78	85	15
98.31	79	84	15
98.37	80	83	15

YDS. TO CUT.	CHANGE GEARS.		
98.40	81	82	15
99.05	78	80	14
99.06	79	79	14
99.14	83	86	16
99.17	84	85	16
99.38	78	86	15
99.48	79	85	15
99.55	80	84	15
99.60	81	83	15
99.61	82	82	15
100.28	78	81	14
100.32	79	80	14
100.33	84	86	16
100.35	85	85	16
100.65	79	86	15
100.74	80	85	15
100.80	81	84	15
100.83	82	83	15
101.52	78	82	14
101.53	85	86	16

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YDS. TO CUT.	CHANGE GEARS.		
101.57	79	81	14
101.59	80	80	14
101.92	80	86	15
102.00	81	85	15
102.04	82	84	15
102.06	83	83	15
102.72	86	86	16
102.76	78	83	14
102.82	79	82	14
102.86	80	81	14
103.20	81	86	15
103.26	82	85	15
103.29	83	84	15
104.00	78	84	14
104.08	79	83	14
104.13	80	82	14
104.14	81	81	14
104.47	82	86	15
104.52	83	85	15
104.53	84	84	15

YDS. TO CUT.	CHANGE GEARS.		
105.24	78	85	14
105.33	79	84	14
105.40	80	83	14
105.43	81	82	14
105.75	83	86	15
105.78	84	85	15
106.48	78	86	14
106.59	79	85	14
106.67	80	84	14
106.71	81	83	14
106.73	82	82	14
107.02	84	86	15
107.04	85	85	15
107.84	79	86	14
107.94	80	85	14
108.00	81	84	14
108.03	82	83	14
108.30	85	86	15
109.21	80	86	14
109.28	81	85	14

YDS. TO CUT.	CHANGE GEARS.		
109.33	82	84	14
109.35	83	83	14
109.57	86	86	15
110.57	81	86	14
110.63	82	85	14
110.67	83	84	14
111.94	82	86	14
111.98	83	85	14
112.00	84	84	14
113.30	83	86	14
113.33	84	85	14
114.67	84	86	14
114.68	85	85	14
116.03	85	86	14
117.40	86	86	14
149.41	86	86	11
150.00	90	90	12

The last two combinations will be found very convenient for making 150 yard cuts. The small gears are rather small to admit a hole the size of the small shaft and it is better to make an extra shaft to use with these with one end turned down to about 9-16 inch and hole in small gear bored to fit.

To find the length of cut, divide the total length of warp by the number of cuts. Then by referring to the Table you can see at a glance what change gears to use.

If your order calls for no cuts you have to suppose that it has cuts and use the proper change gears, the only difference being that you do not tie any cut marks in.

To Find the Weight of a Warp:

RULE: Multiply the whole length of the warp by the number of ends, divide this product by 840 and then divide your quotient by the number of the yarn, your answer will be the number of pounds your warp will weigh single ply. If the warp is 2-ply it will weigh twice as much so multiply by two, if 3-ply multiply by 3, and so on.

EXAMPLE:

Find the weight of a warp of 1075 ends, 720 yards of 30-2-ply yarn.

OPERATION.

1075
720
21500
7525
840)774000.00(921.42x
7560
1800
1680
1200
840
3600
3360
2400
1680

921.42÷30.

30)921.42(30.71
90
214
210
42
30

30.71 x 2.

30.71
2
Ans. 61.42 lbs.

EXPLANATION—1075 ends multiplied by 720 yards gives 774 000 yards. Divide this by 840 the number of yards in one hank and you obtain 921.42 hanks. Divide 921.42 hanks by 30 since it takes 30 hanks of No. 30's yarn to make one pound and you have 30.71 pounds which is the weight of such a warp single ply, 2 ply will weigh twice as much, so 30.71 pounds multiplied by 2 gives the answer 61.42 pounds.

0 018 533 195 7